Explaining the Impact of Formal Institutions on Social Trust: A Psychological Approach

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Abstract

By drawing on psychological models of action choice, this study distinguishes between four key factors that determine trust building: (1) knowledge to trust, (2) others-regarding, (3) cognition, and (4) contexts. These four factors are combined into a single analytical framework that is used for establishing channels through which the institutional context impacts social trust formation. Our theoretical and empirical evidence suggests that context is the strongest determinant of trust, with its overall effect being, however, modified by the degree to which the individual's knowledge of trusting, cognition, and others-regarding are developed. The Programme for the International Assessment of Adult Competencies (PIAAC) data from the year 2012 are utilised for testing our propositions.

Keywords

Social trust, trust formation, formal institutions, action choice, multi-level analysis

JEL Classification Codes: D02, D03, Z10, Z13

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Introduction

Trust is traditionally considered as a cultural attribute that is influenced by an individual's internal values and formed during early socialisation processes (Fukuyama, 2000). Recent studies have dissociated trust building from an individual's personal characteristics and externalised it to contextual properties (Nooteboom, 2007; Rothstein & Stolle, 2001), with formal institutions often viewed as one such contextual factor (Farrell, 2005; Farrell & Knight, 2003).

Analyses of institutional contexts' impact on trust are drawn upon a twofold definition of institutions. First, institutions are viewed as a set of public organisations that individuals interact with over the course of their lives. The process of trust formation is affected by such organisations, as citizens evaluate the quality of their performance (Edlund, 2006; Mishler & Rose, 2001) or that of elected officials (Thomas, 1998). A positive experience motivates individuals to exhibit more trust towards these institutions and people (Letki, 2006; Murphy, 2004; Tyler, 2006). In eliciting trust, public authorities need not be objectively trustworthy, but they must be perceived as such by citizens (Levi, 1998; Scholz & Lubell, 1998).

Second, institutions are viewed as a set of rules that define legal boundaries within which individuals are allowed – and expected – to act. Efficient formal institutions are conducive to establishing trust, since they enforce third-party agreements (Herreros & Criado, 2008). They enable individuals to pursue redress and restitution when wronged, thereby reducing the risk involved in trusting someone (Rothstein & Stolle, 2001; Tillmar &

Lindkvist, 2007) and serving as a safety net (Farrell, 2005). If sanctions and penalties are imposed when a contract is breached, formal institutions may also increase the cost of betrayal (Bohnet & Baytelman, 2007) and overcome the information deficit problem by indicating how others are likely to act (Farrell & Knight, 2003). Formal institutions' impact is especially strong when formal rules are duly enforced (Oskarsson, Öberg & Svensson, 2009) and perceived by individuals as being fairly applied to various population groups (Oskarsson et al., 2009).

Although both strands found empirical evidence for a positive relationship between the quality of formal institutions and trust levels, they exhibit a common deficiency: They lack a clear formalisation of the mechanisms through which institutional contexts influence trust. Most empirical studies either solely examine the associations that exist between trust levels and institutional scores while controlling for the socio-demographic characteristics of respondents (Herreros & Criado, 2008). Or, they offer mathematical models, derived from the rational choice perspective (Zak & Knack, 2001), which do not account for non-cognitive (cultural) forces beyond rational thinking that underlie an individual's decision-making regarding whether or not to trust. In both cases, it becomes impossible to establish the complete set of channels through which formal institutions affect trust among individuals.

This research's main objective is to introduce a new comprehensive model of trust formation in institutional contexts by drawing on various theories of psychology. Since trusting others is a mental operation governed by brain structures, we argue that action choice models can explain how trust emerges and describe what role formal institutions play in this process. Applying a psychological approach to explain trust formation enables addressing cognitive and non-cognitive, as well as conscious and subconscious, mechanisms of an individual's decision-making simultaneously. This allows us to integrate cultural and contextual factors of trust into a single analytical framework.

Literature Overview and Extension

Psychology's point of departure is that every individual defines their own behaviour based on an organized mental representation (scheme) of how an individual with certain values is likely to think, feel, and act (Shao, Aquino & Freeman, 2008), a so called moral identity (Bandura, 1991, 2001; Higgins, 1996; Narvaez, Lapsley, Hagele & Lasky, 2006; Shao et al., 2008). An individual is believed to possess multiple and sometimes competing mental representations that might not exist chaotically, as they are organized according to one's internal understanding of the world (Taatgen, Huss, Dickison & Anderson, 2008). Each of the mental representations is not stored in the individual's memory as mere facts but is augmented with (a) preconditions under which they can be carried out and (b) a representation of their expected outcomes (Taatgen et al., 2008).

Regardless of the actual volume of one's stock of mental representations, only one of them can be activated for processing social information and hence be mapped onto an action at any given moment (Higgins, 1996; Markus & Kunda, 1986). Which one is ultimately activated depends on many factors, including the environment within which the individual is placed (Bargh, Bond, Lombardi & Tota, 1986; Shao et al., 2008). Environmental or contextual properties are often viewed as the key determinant in choosing the mental representation that will be mapped onto an action.

The individual's interaction with the context unfolds through the perceptual system and results in collecting perceptual input (Prinz, 1997). The brain uses the perceptual input to align the observed contextual properties with the preconditions and outcomes of mental representations. When preconditions and expected outcomes match the perceptual input, the corresponding mental representation is mapped onto an action (Taatgen et al., 2008).

Psychology has identified two major problems that may arise during the match process. First, all of the information about the contextual properties is not available or observable. In this case, the individual's internal understanding of the world governs the selection of a mental representation leading to the action (Taatgen 2005, 2007). Second, the mental representation containing the necessary contextual characteristics as a precondition might not be present in one's declarative memory. Experiments show that, in this case, participants simply discover the relevant knowledge of action by taking a random action and observing whether it can bring them closer to the goal. Once the correct action is selected, a new record (mental representation) is created with the original perceptual state as a precondition and the resulting perceptual state as a post-condition (Taatgen et al., 2008).

Personal experience with the context hence shapes the individual's behaviour by activating or triggering the formation of a mental representation that contains the knowledge required for optimal action in the given context. Psychology further suggests that the context's influence may go beyond the individual's own behaviour and can be extended to their expectations regarding other people's behaviour. One's personal experience with the new context may prompt the individual to expect others to act similarly as a result of a similar experience in the given context (Lewis & Weigert, 1985; Jones, 1996). An individual who is positively affected by the context may hence make references from their own behaviour to others' behaviour, re-assessing their perception of others regarding their intentions and motives (Lewis & Weigert, 1985; Jones, 1996).

Analytical Framework

We define trust as an individual's expression of confidence in the intentions and motives of others (Deutsch, 1958; Mellinger, 1956). As such, trust arises through interactions with other people whereas the decision of whether or not to trust someone is based on assessing others'

trustworthiness (Hardin, 2001; Coleman, 1982). We further expand this conventional understanding of trust formation with psychological determinants of action choice while viewing the selection of the level of trust to display as an action. We therefore suggest that trust is determined by four key factors:

$$Trust = f(Knowledge, Others\text{-}regarding, Cognition, Context), \quad (1)$$

where ***Knowledge*** refers to an individual's set of mental representations, with each containing the knowledge of how much trust to exhibit towards others in every particular situation. In line with the psychological models of action choice, we assume that these mental representations are structured according to the individual's internal understanding of the world and that only one of them is activated in any given moment. This results in displaying the level of trust that is embedded within the activated mental representation. We further assume that any knowledge of trust is formed through both early socialisation processes (Rotenberg, 2007) and an individual's past course of actions or past experience with other people (Hardin, 2001).

Others-regarding refers to an individual's perception of other people's motives and intentions. We believe that it is influenced by direct interactions with other individuals and may traditionally include evaluating others' trustworthiness in deciding which level of trust to display. But we deviate from this conventional understanding of how the regarding others enters the trust equation. We focus on the individual's ability to learn from acting in the institutional context and to generalize the impact of formal institutions from one's own behaviour to the behaviour of others, which shapes the individual's expectations about other people's actions**.**

Cognition refers to the individual's general cognitive abilities to perceive, process, and record information, such as declarative memory, procedural memory, and processing speed. This component is expected to predefine the quality and the speed of mental operations involved in collecting the perceptual input about the contexts' properties, the choice of mental representation, and its mapping onto an action.

Context refers to the properties of the institutional context that the individual perceives and utilises to match the preconditions and outcomes of mental representations in choosing the mental representation that will be mapped onto an action.

We model trust formation, as defined by the four factors, as follows (please see Figure 1). An individual possesses (1) a cognitive system of certain qualities and (2) a set of mental representations that store information regarding how much they can trust others in various institutional contexts. The knowledge stored in these mental representations is assumed to stem from the individual's cultures, experiences, and overall goals. In accordance with the psychological models, we expect that these mental representations are augmented by (a) the precondition that specifies which level of trust should be displayed in a certain institutional context, and (b) the expected outcome that this particular level of trust may lead to in this institutional context. In choosing the level of trust, the individual evaluates the context in which they are placed and forms expectations about other people's motives or intentions in this context. Both pieces of information are linked and matched to the preconditions and outcomes of mental representations. The one that corresponds to the match criteria is selected and the level of trust stored in this mental representation will be displayed. If no match is found, the individual randomly selects the level of trust to display towards others. It will be stored as a new mental representation if the new level of trust is sufficient to bring the individual closer to their goals. If the chosen level of trust is insufficient for the given context, random selection is repeated until the match between one's goals and the outcomes

of exhibiting this certain level of trust is found. Personal experience with the context is further extrapolated by the individual to other people acting in the same context, reshaping this individual's expectations regarding other people's behaviour in the given contextual properties. The individual uses this information to determine which level of trust to exhibit towards others in later interactions, provided that the contextual properties and one's personal experience with them remain unchanged.

Figure 1 about here

We further argue that the context's ultimate impact on the individual's level of trust is related to the individual's knowledge, others-regarding, and cognition. ***Proposition 1:*** We expect that the institutional context's positive impact on trust is greater for individuals who already possess mental representations with the knowledge of exhibiting sufficiently high levels of trust. Good institutional contexts may encourage the up-levelling of trust by activating a mental representation corresponding to high trust levels. In order to become active, the brain should previously have recorded such mental representation. If this is not the case, the individual is less likely to display the optimal level of trust in good institutional contexts. When lacking a match, the individual must randomly select a trust level and analyze this action's consequences. Since this process usually involves errors, it may take time before the right level of trust is determined and stored as a new record in the brain. Additionally, the brain chooses a new level of trust, even when randomly or not, through drawing analogies with the existing knowledge of trust. This suggests that any positive, even substantial, developments in the institutional context are unlikely to lead to a sudden leap from distrust to complete trust for the individual with no, or little, knowledge to trust. Rather, trust levels will

gradually increase, as the individual chooses to display more and more trust until the optimal level of trust is attained.

Proposition 2: We expect that the institutional context's positive impact on trust will be greater for individuals who can better extrapolate their own positive experiences from the context to others. To trust others, one must account for others' motives and intentions. One's expectations regarding others' motives and intentions can change when the new institutional context provides positive experiences. When an improved institutional environment triggers a positive change in one's own behaviour, the individual may assume that this context can also encourage other individuals to act more honestly, ameliorating this individual's expectation regarding others' motives and intentions, which leads to higher trust levels towards them. The overall change in trust levels through this extrapolation mechanism may hence depend on the extent to which the individual is able or willing to make references from their own experience with the new context to other people's behaviour. The individual who has a more developed extrapolation mechanism is expected to display more trust towards others when the institutional context improves.

Proposition 3: We expect that the context's positive impact on social trust is stronger for individuals who possess a better cognitive system. The action choice process includes numerous mental operations, such as collecting perceptual input, coupling between perceived contextual properties and preconditions or outcomes of mental representations, and mapping the selected mental representation onto an action. As such, an individual's general cognitive abilities may determine the speed and quality with which the brain performs these operations. Because the matching and learning processes are usually faster and more efficient for individuals with better cognition, we expect that such individuals are more responsive to positive changes in contextual properties, and hence the contextual improvements' positive impact on trust is greater for them. We also acknowledge that this impact is strong in the

periods immediately following a change in institutional contexts and tends to subside when an individual attains the right level of trust in the new or changed institutional environment.

We use the above observations to postulate our hypotheses:

***Hypothesis 1*:** The institutional context's positive impact on trust is greater for individuals who possess better knowledge to trust.

***Hypothesis 2*:** The institutional context's positive impact on trust is greater for individuals who have a more developed extrapolation mechanism.

Hypothesis 3: The institutional context's positive impact on trust is greater for individuals who have a better cognitive system.

Data and Methods Description

To test our hypotheses, we utilise the public use data from the Programme for the International Assessment of Adult Competencies (PIAAC) conducted in 2012 (see https://www.oecd.org/site/piaac/surveyofadultskills.htm for a more detailed description of the PIAAC survey). This database is unique, because it provides the measure of social trust limited to faith in other people and not linked to the individual's caution levels as is often the case in socio-economic surveys (Ben-Ner & Halldorsson, 2010; Miller & Mitamura, 2003). Our sample includes Austria, Belgium (Flanders), the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation, the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland), and the USA. Australia and Canada are excluded from the analysis, since data for many variables were suppressed for these countries. The sample is restricted to respondents aged between 16 and 65 years.

We use the following set of variables to empirically test our hypotheses (please see Table 1 for descriptive statistics).

Table 1 about here

Dependent variable

Social trust is approximated by asking the respondents to specify whether they agree with the statement that they can only trust a few people completely. The response scale varies from 1 “strongly agree” to 5 “strongly disagree”.

Independent variables

In operationalizing *Knowledge*, we adopted the conventional assumption that involvement in voluntary associations leads individuals to form trust. Volunteering is expected to offer regular and close contact with others, and such contacts help to develop reciprocity, cooperation, empathy for others, an understanding of the common interest and common good and, as a result, the knowledge of trust (Brehm & Rahn, 1997; Putnam, 2000; Paxton, 2002). The volunteering variable is operationalized through the question asking how often the respondent did voluntary work in the last 12 months, with the response values ranging between 1 “never” and 5 “every day”.

Others-regarding is expected to capture whether the respondent tends to link or extrapolate their own knowledge/experiences to others and is measured through a synthetic construct obtained by adding the responses to six questions about the extent to which the respondent agrees with the following statements: (1) When I learn or read about new ideas, I try to relate them to real life situations to which they might apply, (2) I like learning new things, (3) When I come across something new, I try to relate it to what I already know, (4) I like to get to the bottom of difficult things, (5) I like to figure out how different ideas fit together, and (6) If I do not understand something, I look for additional information to make

it clearer. The final construct has a scale ranging between 6 and 30, with higher values corresponding to a greater subjective propensity to extrapolate information.

Cognition is measured through the individual's cognitive abilities and is constructed by averaging out the cognitive test results in literacy and numeracy, as in Blau and Kahn (2005). Each of the two constructs represents a mean of ten possible values that the PIAAC survey provides.

Context is operationalized through the perceived legitimacy of governmental policies. The legitimacy variable is expected to reflect the quality of the country's institutional environment and is measured through the extent to which the respondents agree with the following statement: "People like me do not have any say about what the government does". The response scale ranges between 1 "strongly agree" to 5 "strongly disagree".

Control variables

We control for the conventional determinants of trust: respondents' education level, income, health condition, living with a spouse or partner, the presence of children in the household, immigration status, and age. The education level is measured by two dummies. The first takes the value of 1 if the respondent has obtained a higher-level education, and the second takes the value of 1 if the respondent has obtained a middle-level education. A low education is used as a reference category. The income variable is operationalized through the PIAAC derived variable which specifies the decimal to which the respondent's yearly income belongs. The health condition is measured through a question asking respondents to self-rate their health status from 1 "excellent" to 5 "poor". The living with a spouse or partner variable is a dummy that takes the value of 1 if the respondents declare living with a spouse or partner. The presence of children in the household is measured by a dummy variable that takes the value of 1 if the respondents declare that the household has at least one child. Immigration status is captured by a dummy variable that takes the value of 1 if the individual

was born in the country where the survey was conducted. The respondents' age is measured in ten-year bands.

Additionally, we include learning-related and work-related controls in the trust regression. Participation in lifelong learning is measured by questions where respondents specify whether they did any of the following learning activities within the last twelve months: (1) courses or private lessons, (2) seminars or workshops, (3) courses conducted through open or distance education, or (4) any organized on-the-job training sessions or training by supervisors or co-workers. The final construct's response scale ranges from 0 "no participation in lifelong learning" to 4 "active participation in lifelong learning". Unrealized learning is measured by a dummy variable that takes the value of 1if the individual specifies that, in the last 12 months, there were learning activities the individual wanted to participate in but did not. Learning on the job is a synthetic variable constructed by summing up responses to three questions asking how often the current job involves: (1) learning new work-related things from co-workers or supervisors, (2) learning-by-doing from tasks one performs, and (3) keeping up-to-date with new products or services. Each item has a response scale ranging from 1 "never" to 5 "every day" so that the final construct has values between 3 "no learning on the job" and 15 "active learning on the job".

We also control for job tasks and emotions-related variables. Based on a factor analysis, we combined job-task questions into four constructs, as presented in the social trust base model. The respondents' involvement in managerial responsibilities is captured by a dummy variable that takes the value of 1 if the respondent currently manages or supervises other employees. The level of workplace stress due to the workload is operationalized through the number of weekly work hours. Skill mismatch is measured through a dummy that takes the value of 1 if the respondents specify that they can cope with more demanding duties than those they are currently required to perform.

Finally, we control for the respondent's job sector, job stability, and workplace freedom. The job sector is measured through two dummies specifying whether the individual's job belongs to the public or non-profit sector, with the private sector representing a reference category. Job stability is measured by the number of different firms or organisations the respondent has changed in the last five years. The freedom at workplace is derived by asking whether the individual can choose or change their working hours. The response scale varies from 1 "not at all" to 5 "to a very high extent".

Methods used in the analysis

The main method of analysis is multilevel modelling, which accounts for our data's hierarchical structure and prevents the un-modelled country information from being pooled into the single individual error term (Kreft & Leeuw, 1998; Luke, 2004). The base model takes the following form:

$$T_{ij} = \gamma_{00} + \gamma_{10}Knowledge_{ij} + \gamma_{20}Others\text{-}regarding_{ij} + \gamma_{30}Cognition_{ij} + \gamma_{40}Context_{ij} + \gamma_{50}X_{ij} + m_{oj} + \varepsilon_{ij} \quad (2)$$

Here, T_{ij} stands for the individual level of social trust. $Knowledge_{ij}$, $Others\text{-}regarding_{ij}$, $Cognition_{ij}$, and $Context_{ij}$ are the measures for the knowledge, others-regarding, cognition, and contextual factors, respectively. X_{ij} is a set of control variables, m_{oj} is the variance at the country level, and ε_{ij} is the variance at the individual level. We further augment the base model by including interaction terms between the context and the three other factors as follows:

$$T_{ij} = \gamma_{00} + \gamma_{10}Knowledge_{ij} + \gamma_{20}Others\text{-}regarding_{ij} + \gamma_{30}Cognition_{ij} + \gamma_{40}Context_{ij} + \gamma_{50}Knowledge*Context_{ij} + \gamma_{60}Others\text{-}regarding*Context_{ij} + \gamma_{70}Cognition*Context_{ij} + +\gamma_{80}X_{ij} + m_{oj} + \varepsilon_{ij} \quad (3)$$

where T_{ij} is trust scores, $Knowledge_{ij}$, $Others\text{-}regarding_{ij}$, $Cognition_{ij}$, and $Context_{ij}$ are the measures for the four trust factors as described above. $Knowledge*Context_{ij}$, $Others\text{-}regarding*Context_{ij}$, and $Cognition*Context_{ij}$ are the interaction terms between the contextual factor and the three other trust factors that are (sequentially) included in the base model. Again, X is the set of individual-level control variables, m is the country-level variance, whereas ε is the individual-level variance.

The STATA *gllamm* command is utilised to calculate the model's parameters. Since social trust is an ordinal variable, the *ologit* link is specified together with the *binomial* family sub-options. Additionally, we include the GLLAMM *adapt* option, which causes adaptive quadrature to be used instead of ordinary quadrature.

Analysis and Results

The results of the social trust base model are consistent with previous findings concerning the impact of conventional trust determinants and work-related factors on trust levels (please see Table 2). Augmenting the base model with the four factors substantially improves the model's fit. Overall, our results indicate that individuals with more knowledge of trust tend to have higher trust scores (please see Table 3). Similarly, individuals with a better cognitive system display more trust. Surprisingly, a more developed extrapolation mechanism is associated with lower trust levels. Finally, individuals who assign higher scores to formal institutions have higher trust scores. These impacts do not change after applying the selected strategies of robustness check, such as (1) controlling for sample size variations (please see

Appendix 1 for results), or (2) controlling for endogeneity in the relationship between the four components and social trust (please see Appendix 2 for results).

Table 2 and Table 3 about here

Among the four factors that our model introduced, context proves the strongest determinant of social trust. The model's fit measured through the log likelihood change improves substantially after including the institutional variable in the trust equation. The formal institutions' role in trust building also increases after accounting for the interactions between the institutional context and one's knowledge, others-regarding, and cognition (please see Table 4). In line with Hypothesis 1, the institutional context's positive impact on social trust is significantly greater for individuals who possess better knowledge of trusting others. Our analysis also suggests that the further the relative distance between the optimal level of knowledge of trusting, which was calculated as the highest country-level value (Norway), and the individual's actual knowledge of trusting, the less important the institutional context becomes for the trust formation process. The contextual effects on trust are also stronger for individuals who have a more developed extrapolation mechanism and can better generalize new knowledge to new domains or to others' behaviours. This positive interaction effect has been found regardless the fact that the others-regarding variable is negatively associated with trust levels. We do not detect any interaction between the context and the cognition variables and hence more intelligent or more able individuals do not show a stronger impact of good formal institutions on trust levels. Nonetheless, we reveal a strong interaction between the knowledge and cognition variables, suggesting that the formation of knowledge to trust occurs faster for more able individuals.

Table 4 about here

Overall, the empirical analysis supports our four factor model of trust creation. Our results confirm that the institutional context is not only the strongest determinant of trust building but also stands in a close relationship to the three other factors in the trust formation process. To analyze how imbalances in the four factors' maturity levels may impact trust formation, we group countries according to their values on these four factors. By applying a hierarchical cluster analysis to the aggregated dataset (please see Figure 2), we distinguish between four country groups (please see Table 5). The first encompasses Finland, Japan, the Netherlands, Norway, and Sweden, where all the four components take high values, resulting in high trust levels. The second group includes France, Ireland, Korea, Poland, the UK, and the USA, where the knowledge component is slightly better developed than the cognition and context components, resulting in average levels of trust. The third group consists of Austria, Belgium, the Czech Republic, Denmark, Estonia, Germany, the Russian Federation, and the Slovak Republic, with lower scores on volunteering but relatively good values on the cognitive and contextual components, with trust scores being close to those of the second group. The fourth group includes Italy and Spain, where all the four components are underdeveloped compared to other countries, resulting in the sample's lowest trust levels. One should note that the others-regarding component does not show a substantial variation across the country groups. In Figure 3, we provide a four-dimensional visualization of this country grouping.

Table 5 about here

Figure 2 and Figure 3 about here

To estimate the four groups' potential to increase social trust levels by improving their context, we conduct a prediction exercise in which we assign the context variable's highest value of 5 to the individuals' contextual component while keeping the three other components unchanged. The STATA gllapred option (for more details see Rabe-Hesketh and Skrondal, 2008) is used to make the predictions. The procedure requires first conducting a multilevel analysis of actual trust scores and then calculating predictions. In doing so, we calculate the marginal cumulative probability and conditional cumulative probabilities with random intercept equal to zero. We further calculate a mean value of such predictions for each country and report them in comparison to the actual value of trust (please see Table 6). Our analysis reveals that even if all people in the selected countries have a similarly positive perception of a government's effectiveness, the trust scores still remain heterogeneous across the four groups. Group 1, with the best scores on the four factors, has the highest predicted trust levels. Group 4, with the lowest scores on the four factors, has the lowest predicted trust scores. Interestingly, our results suggest that Group 3, with a poor volunteering tradition but high values on the cognitive component, will improve trust scores to a slightly greater extent than Group 2, with a more developed tradition of volunteering but relatively worse investments in formal and non-formal education. Both groups however still remain behind Group 1 in their predicted trust levels. This finding's key implication is that an individual's response to improving institutional contexts depends not only on an actual change in formal institutions, but also on the quality of the individual's stock of knowledge to trust, cognition, and the degree to which this individual applies the extrapolation mechanism in analyzing their own and others' behaviour.

Table 6 about here

Conclusion and Discussion

Overall, our study supports the four factor conceptual framework of trust formation. Both theoretical and empirical elaborations indicate that formal institutions can considerably modify the dynamics and patterns of trust building processes. Our results are in line with the previous findings, demonstrating that "the public" is an important determinant of "the private" (Kumlin & Rothstein, 2007), but the extent to which "the public" ultimately intervenes into "the private" depends on the actual properties of this "private". The context's overall impact on trust is a function of a particular individual's actual properties, such as current stocks of knowledge of trusting, the distance between the current knowledge and the optimal level of knowledge for the given context, ones' cognition, and the ability to learn and extrapolate one's own knowledge and experiences to other individuals. These properties set certain constraints in the relationship between the formal institutional context and social trust.

Further research is needed to eliminate two major drawbacks of our study. First, an alternative set of operationalisations should be found for each of the four factors to further validate the complex structure of the trust formation processes introduced by our model. Second, it is necessary to check the dynamic nature of the relationship between the four factors and social trust by testing the proposed analytical framework with longitudinal data.

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Table 1. Descriptive Statistics for the Key Variables Used in the Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Social trust	76558	1.000	5.000	2.362	1.161
Knowledge	76658	1.000	5.000	1.642	1.019
Distance to knowledge	76658	-0.579	1.101	0.646	0.627
Orhers-regarding	76055	6.000	30.000	21.950	4.359
Cognition	76711	37.870	426.120	278.129	42.914
Context	76289	1.000	5.000	2.767	1.259
Respondent's education level					
Highly-educated	73509	0.000	1.000	0.396	0.489
Middle-educated	73509	0.000	1.000	0.461	0.498
Yearly income percentile	70921	1.000	6.000	3.335	1.532
Age	76722	1.000	5.000	3.108	1.266
Health status	76651	1.000	5.000	2.480	0.985
Living with a spouse or partner	66705	0.000	1.000	0.741	0.438
Children in the household	76659	0.000	1.000	0.649	0.477
Born in the country	76689	0.000	1.000	0.909	0.287
Lifelong learning	75372	0.000	4.000	0.903	0.967
Unrealized learning	75388	0.000	1.000	0.269	0.443
Learning in the job	70006	3.000	15.000	9.847	3.111
Job tasks					
Teaching, presentations, planning for others	76570	3.000	15.000	6.802	3.514
Cooperating or sharing information with others	70243	2.000	10.000	7.633	2.213
Selling, advising or influencing others	76373	4.000	20.000	11.464	4.952
Planning or organizing activities for oneself	76502	2.000	10.000	8.079	2.704
Managerial responsibilities	66329	0.000	1.000	0.289	0.454
Economic sector PRIVATE	76550	0.000	1.000	0.724	0.447
Economic sector PUBLIC	76550	0.000	1.000	0.249	0.433
Economic sector NONPROFIT	76550	0.000	1.000	0.027	0.161
Number of firms worked in	76604	0.000	7.000	1.810	1.267
Flexibility with working hours	76649	1.000	5.000	2.658	1.407
Job satisfaction	76657	1.000	5.000	1.993	0.843
Working hours per week	73163	1.000	125.000	38.319	13.441
Skill mismatch	76032	0.000	1.000	0.832	0.374

Table 2. Social Trust Base Model

VARIABLES	(1)	(2)	(3)	(4)
Respondent's education level				
Highly- educated		0.732***	0.646***	0.598***
		(0.026)	(0.030)	(0.031)
Middle-educated		0.212***	0.195***	0.179***
		(0.024)	(0.028)	(0.028)
Yearly income percentile		0.050***	0.030***	0.048***
		(0.006)	(0.007)	(0.008)
Age		0.075***	0.084***	0.067***
		(0.008)	(0.009)	(0.009)
Health status		-0.122***	-0.119***	-0.107***
		(0.009)	(0.009)	(0.009)
Living with a spouse or partner		0.073***	0.072***	0.068***
		(0.020)	(0.022)	(0.022)
Children in the household		-0.107***	-0.099***	-0.114***
		(0.022)	(0.023)	(0.023)
Born in the country		0.229***	0.217***	0.182***
		(0.028)	(0.031)	(0.030)
Lifelong learning			0.101***	0.087***
			(0.009)	(0.009)
Unrealized learning			-0.031	-0.021
			(0.019)	(0.019)
Learning in the job			0.009***	0.005
			(0.003)	(0.003)
Job tasks				
Teaching, presentations, planning for others			0.025***	0.021***
			(0.003)	(0.003)
Cooperating or sharing information with others			0.001	0.005
			(0.004)	(0.004)
Selling, advising or influencing others			-0.004**	-0.003
			(0.002)	(0.002)
Planning or organizing activities for oneself			0.008**	0.002
			(0.004)	(0.004)
Managerial responsibilities			-0.078***	-0.079***
			(0.022)	(0.022)
Economic sector PUBLIC				0.134***
				(0.020)
Economic sector NON-PROFIT				0.260***
				(0.051)
Number of firms worked in				-0.014**
				(0.007)
Flexibility with working hours				0.052***
				(0.007)
Job satisfaction				-0.097***
				(0.011)
Working hours per week				-0.004***
				(0.001)
Skill mismatch				-0.086***
				(0.023)
Between-class variance	0.272	0.336	0.279	0.333
	(0.084)	(0.048)	(0.084)	(0.065)
Log likelihood	-102739.970	-77694.231	-66789.354	-66530.996
Number of level 2 units	21	20	20	20
Number of level 1 units	75,718	58,277	50,245	50,149

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Social Trust Augmented Model, with the Four Psychological Factors

VARIABLES	(1)	(2)	(3)	(4)	(5)
Knowledge	0.083***				0.064***
	(0.009)				(0.009)
Others-regarding		-0.008***			-0.021***
		(0.002)			(0.002)
Cognition			0.004***		0.003***
			(0.000)		(0.000)
Context				0.377***	0.372***
				(0.008)	(0.008)
Constant					
Cut 1	-0.712***	-0.918***	0.153	-0.078	0.474***
	(0.120)	(0.142)	(0.104)	(0.093)	(0.105)
Cut 2	1.375***	1.167***	2.245***	2.085***	2.646***
	(0.120)	(0.142)	(0.104)	(0.094)	(0.106)
Cut 3	1.986***	1.777***	2.857***	2.712***	3.276***
	(0.121)	(0.142)	(0.105)	(0.094)	(0.106)
Cut 4	3.907***	3.696***	4.780***	4.672***	5.238***
	(0.122)	(0.143)	(0.107)	(0.096)	(0.108)
Control variables	Yes	Yes	Yes	Yes	Yes
Between-class variance	0.244	0.254	0.262	0.347	0.262
	(0.065)	(0.081)	(0.046)	(0.037)	(0.025)
Log likelihood	-65961.077	-65999.889	-65876.738	-64743.043	-64606.693
Number of level 2 units	20	20	20	20	20
Number of level 1 units	49,766	49,766	49,766	49,766	49,766

Notes: Standard errors in parentheses. The list of controls includes the full set of variables from the social trust base model.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4. Interactions between the Key Trust Factors

VARIABLES	(1)	(2)	(3)	(4)	(5)
Knowledge	0.011		0.064***	0.064***	-0.239***
	(0.022)		(0.009)	(0.009)	(0.062)
Distance to Knowledge		-0.015			
		(0.036)			
Others-regarding	-0.021***	-0.021***	-0.035***	-0.021***	-0.021***
	(0.002)	(0.002)	(0.005)	(0.002)	(0.002)
Cognition	0.003***	0.003***	0.003***	0.003***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Context	0.343***	0.395***	0.255***	0.322***	0.372***
	(0.013)	(0.011)	(0.036)	(0.048)	(0.008)
Context * Knowledge	0.018***				
	(0.006)				
Context * Distance to Knowledge		-0.035***			
		(0.011)			
Context * Others-regarding			0.005***		
			(0.002)		
Context * Cognition				0.001	
				(0.000)	
Knowledge * Cognition					0.001***
					(0.000)
Control variables	Yes	Yes	Yes	Yes	Yes
Between-class variance	0.262	0.262	0.244	0.222	0.258
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
Log likelihood	-64603.251	-64596.754	-64600.768	-64605.357	-64593.684
Number of level 2 units	20	20	20	20	20
Number of level 1 units	49,766	49,766	49,766	49,766	49,766

Notes: Standard errors in parentheses. The list of controls includes the full set of variables from the social trust base model.

*** p<0.01, ** p<0.05, * p<0.1.

Table 5. The Four Factors' Mean Values, by Country Group

	Country	Knowledge	Others-regarding	Cognition	Context
Group 1	Finland Japan The Netherlands Norway Sweden	1.8 (Strong)	21.8 (Average)	291.3 (Strong)	3.1 (Strong)
Group 2	France Ireland Korea Poland The UK The USA	1.6 (Relatively Strong)	21.9 (Average)	270.5 (Relatively Weak)	2.7 (Relatively Weak)
Group 3	Austria Belgium The Czech Republic Denmark Estonia Germany The Russian Federation The Slovak Republic	1.5 (Relatively Weak)	21.9 (Average)	280.7 (Relatively Strong)	2.8 (Relatively Strong)
Group 4	Italia Spain	1.4 (Weak)	22.9 (Relatively Strong)	258.4 (Relatively Weak)	2.3 (Weak)

Table 6. Predicted Levels of Social Trust, by Country Group

		Actual trust scores	Predicted social trust scores							
			Linear	Conditional cumulative probabilities				Marginal cumulative probabilities			
				above 1	above 2	above 3	above 4	above 1	above 2	above 3	above 4
Group 1	Finland	2.785	2.742	0.902	0.523	0.373	0.080	0.893	0.522	0.379	0.088
	Japan	2.329	2.745	0.902	0.524	0.373	0.079	0.894	0.523	0.380	0.088
	Netherlands, the	2.733	2.762	0.903	0.527	0.378	0.081	0.894	0.526	0.385	0.089
	Norway	2.846	2.804	0.906	0.538	0.389	0.085	0.897	0.536	0.394	0.094
	Sweden	2.839	2.802	0.906	0.537	0.387	0.085	0.898	0.536	0.393	0.093
	Group average	***2.706***	***2.771***	***0.904***	***0.530***	***0.380***	***0.082***	***0.895***	***0.529***	***0.386***	***0.090***
Group 2	France	1.939	2.589	0.887	0.486	0.339	0.069	0.878	0.487	0.347	0.077
	Ireland	2.206	2.672	0.894	0.506	0.358	0.075	0.886	0.506	0.365	0.083
	Korea	2.239	2.539	0.882	0.474	0.328	0.067	0.872	0.475	0.337	0.074
	Poland	2.306	2.486	0.878	0.460	0.316	0.062	0.861	0.449	0.314	0.066
	UK, the	2.259	2.670	0.894	0.506	0.358	0.075	0.885	0.505	0.365	0.083
	USA, the	2.341	2.642	0.890	0.499	0.353	0.075	0.881	0.499	0.360	0.082
	Group average	***2.215***	***2.600***	***0.888***	***0.489***	***0.342***	***0.071***	***0.877***	***0.487***	***0.348***	***0.078***
Group 3	Belgium	2.315	2.703	0.898	0.514	0.365	0.078	0.889	0.513	0.372	0.085
	Czech Rep., the	1.956	2.538	0.883	0.474	0.328	0.066	0.873	0.475	0.336	0.073
	Denmark	3.181	2.811	0.906	0.539	0.390	0.086	0.898	0.537	0.396	0.094
	Estonia	2.008	2.590	0.887	0.486	0.339	0.069	0.878	0.487	0.347	0.077
	Germany	2.263	2.669	0.894	0.506	0.358	0.075	0.885	0.505	0.365	0.083
	Russian Fed., the	2.332	2.486	0.878	0.461	0.316	0.062	0.868	0.463	0.325	0.069
	Slovak Rep., the	2.009	2.496	0.879	0.463	0.318	0.063	0.869	0.465	0.327	0.069
	Group average	***2.295***	***2.613***	***0.889***	***0.492***	***0.345***	***0.071***	***0.880***	***0.492***	***0.353***	***0.079***
Group 4	Italy	1.948	2.434	0.872	0.449	0.306	0.060	0.861	0.451	0.315	0.067
	Spain	2.323	2.459	0.872	0.455	0.313	0.062	0.862	0.457	0.321	0.069
	Group average	***2.136***	***2.447***	***0.872***	***0.452***	***0.310***	***0.061***	***0.862***	***0.454***	***0.318***	***0.068***

Notes: The model used for calculating the predictions is as follows: *Trust = 0.064Knowledge–0.021Others_regarding+0.003Cognition+0.372Context+ 0.393Respondent_highly_educated+0.095Respondent_middle_educated+0.022Income+0.079Age–0.092Health_status+0.061Living_with_spouse– 0.088Children+0.051Born_in_the_country+0.061Lifelong_learning-0.045Unrealized_learning+0.008Leanring_in_the_job+0.017Job_tasks_1+0.009Job_tasks_2 – 0.006Job_tasks_3–0.001Job_tasks_4 – 0.077Managerial_responsibilities+0.115Economic_sector_PUBLIC+0.187Economic_sector_NONProfit– 0.022Number_of_firms_worked+0.035Flexibility–0.082Job_satisfaction–0.003Working_hours–0.080Skill_mismatch*. Predictions are calculated by assuming that all respondents assign the institutional context the highest value of "5".

Appendix 1.

Robustness Check: Variations in the Sample Size

VARIABLES	(1)	(2)	(3)	(4)
Knowledge	0.071***	0.064***	0.064***	0.119***
	(0.012)	(0.009)	(0.009)	(0.010)
Others-regarding	-0.023***	-0.021***	-0.021***	-0.016***
	(0.003)	(0.002)	(0.002)	(0.002)
Cognition	0.003***	0.003***	0.003***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)
Context	0.368***	0.370***	0.373***	0.366***
	(0.011)	(0.008)	(0.008)	(0.008)
Constant				
Cut 1	0.134	0.470***	0.482***	0.871***
	(0.158)	(0.107)	(0.106)	(0.068)
Cut 2	2.309***	2.639***	2.656***	2.994***
	(0.158)	(0.108)	(0.107)	(0.069)
Cut 3	2.964***	3.268***	3.283***	3.680***
	(0.159)	(0.108)	(0.107)	(0.070)
Cut 4	4.928***	5.233***	5.246***	5.482***
	(0.162)	(0.110)	(0.109)	(0.075)
Control variables	Yes	Yes	Yes	No
Log-likelihood	-32117.430	-63431.947	-63797.939	-50204.806
Between-class variance	0.313	0.519	0.261	0.300
	(0.054)	(0.042)	(0.024)	(0.033)
Observations	24,625	48,818	49,148	39,463

Notes: Robust standard errors in parentheses. The list of controls includes social trust base model's variables. In column (1), we follow Kuckulenz and Zwick (2003) and restrict our analysis to male employees since the effects of learning for women require a different modelling approach. In column (2), we restrict the sample to employees with hours per week top coded at 60 since hours worked vary widely in our dataset. In column (3), the sample is restricted to people aged between 20-65 to avoid a bias caused by the fact that the majority of young people between the ages of 16 and 20 are still being educated and hence those in the labour market might not be representative of the young population (Hanushek, Woessmann & Zhang, 2011). In column (4), we restrict our sample to the respondents who are not employed or out of the labour market for any reason whereas limiting the trust regression to the four factors introduced by our model. This strategy is expected to offset the bias caused by the fact that trust base model includes many employment-related variables and hence our analysis is often performed on the sample of employed individuals.

* p < .10. ** p < .05. *** p < .01.

Appendix 2.

Robustness Check: Controlling for Endogeneity in Trust Regressions

VARIABLES	(1)	(2)	(3)	(4)
Knowledge	1.306***	0.086***	0.101***	0.044***
	(0.059)	(0.006)	(0.005)	(0.006)
Others-regarding	-0.027***	-0.043***	-0.006***	-0.016***
	(0.002)	(0.007)	(0.001)	(0.002)
Cognition	0.001	0.003***	0.002***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Context	0.178***	0.247***	0.256***	0.758***
	(0.007)	(0.005)	(0.004)	(0.019)
Constant	0.324***	-0.047	0.937***	0.418***
	(0.057)	(0.124)	(0.083)	(0.043)
Observations	55,323	40,173	63,919	55,537

Notes: Robust standard errors in parentheses. Column (1) contains the results of an instrumental variable (IV) regression, in which knowledge to trust is instrumented with an individual's working hours per week and countries' mean values for respondents' altruism levels. The altruism variable is considered to be the foundation of trust and is operationalized through the question asking the extent to which respondents agree that is important to help other people and care about others' wellbeing. The European Social Survey (ESS) data from the year 2012 are used as a source for the altruism variable. Column (2) reports the results of an IV regression, in which we instrument the others-regarding component with the following set of PIAAC variables: the respondent's work experience length in years, the type of the respondent's employment contract, the intensity of computer use at work, the need for further training, company size, number of people living in the respondent's household, and the respondent's job industry code. Column (3) reports the results for the IV regression, in which the cognition component is instrumented with the mother's immigration background and the number of people living in the respondent's household. In addition, we employ a conventional psychological approach to instrument the respondent's genetics through the mother's level of education (Cunha & Heckman, 2008). Column (4) presents the results of an IV regression in which we instrument the contextual component with the Freedom House civil liberties index (as in Fidrmuc, 2003) and countries' morale culture calculated as the average of responses to two ESS questions asking whether respondents consider it wrong to (1) make an exaggerated or false insurance claim and (2) buy something that they think might be stolen.

* p < .10. ** p < .05. *** p < .01.

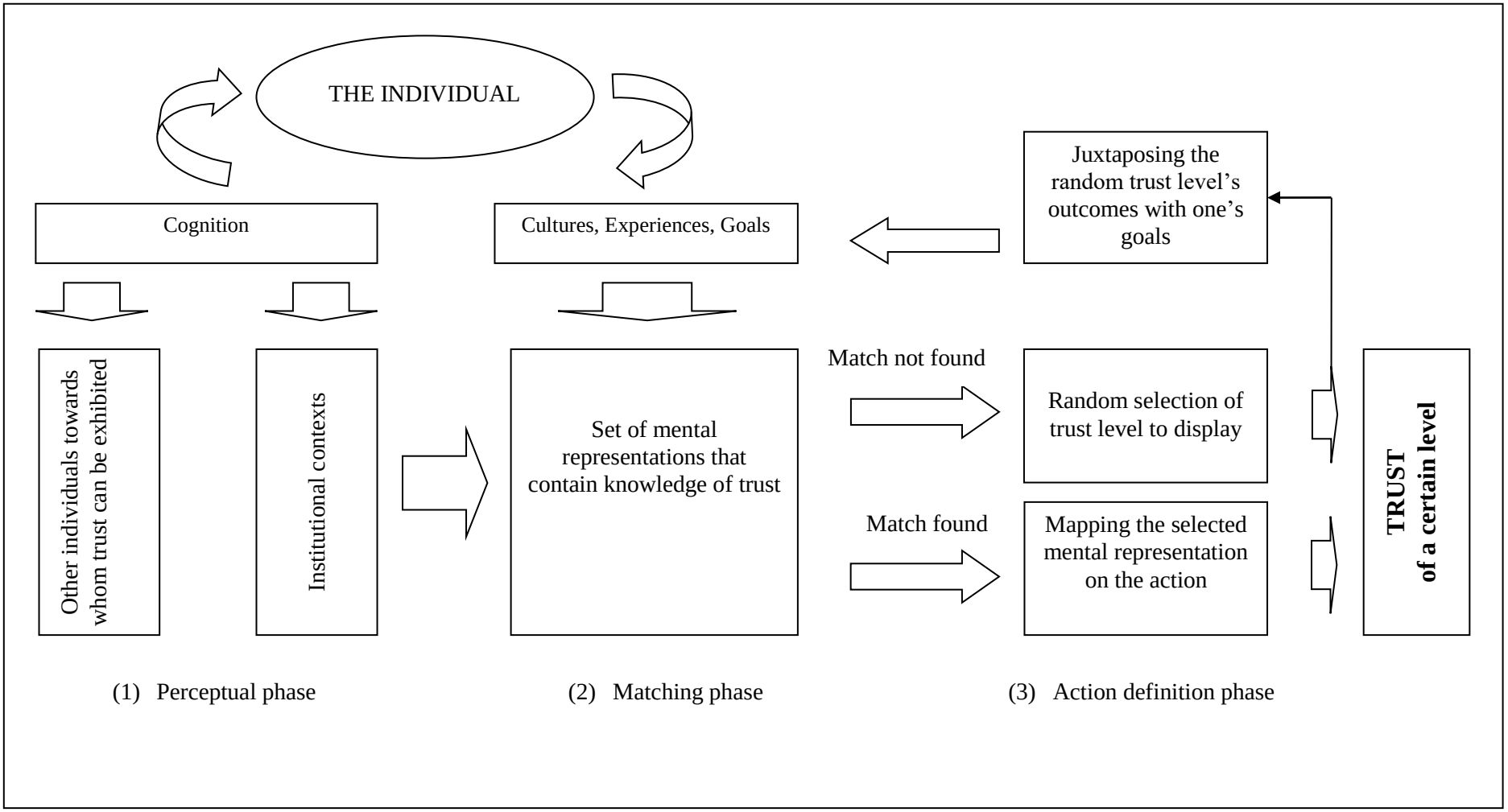

Figure 1. Model of Trust Level Choice

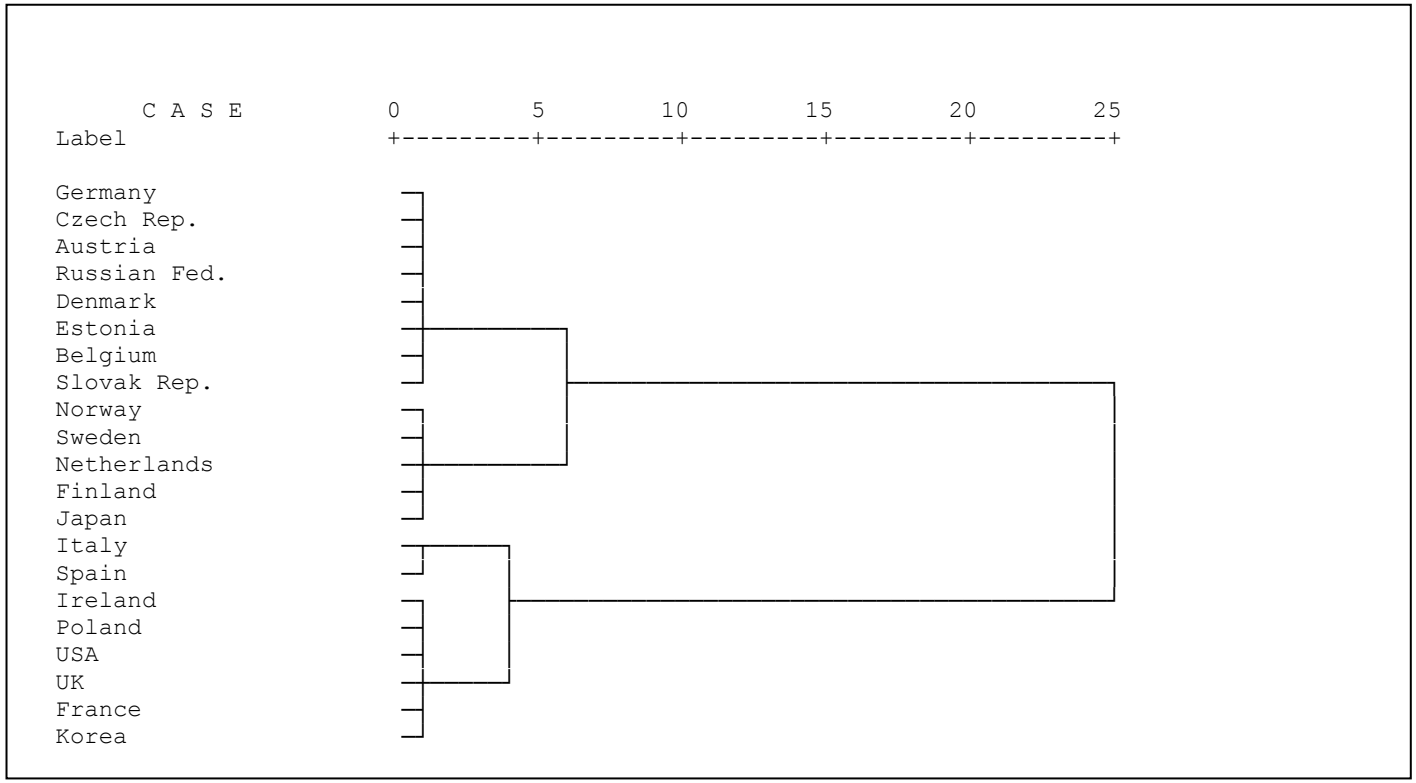

Figure 2. Grouping of Countries Based on the Four Trust Factors

Notes: Dendrogram using Complete Linkage. Cluster method: furthest neighbour. Interval measure: squared Euclidean distance. Austria is included in the cluster analysis despite the fact that this country has been omitted from the majority of calculations due to the lack of many work-related or education-related variables. Excluding Austria from the cluster analysis did not alter the above country grouping.

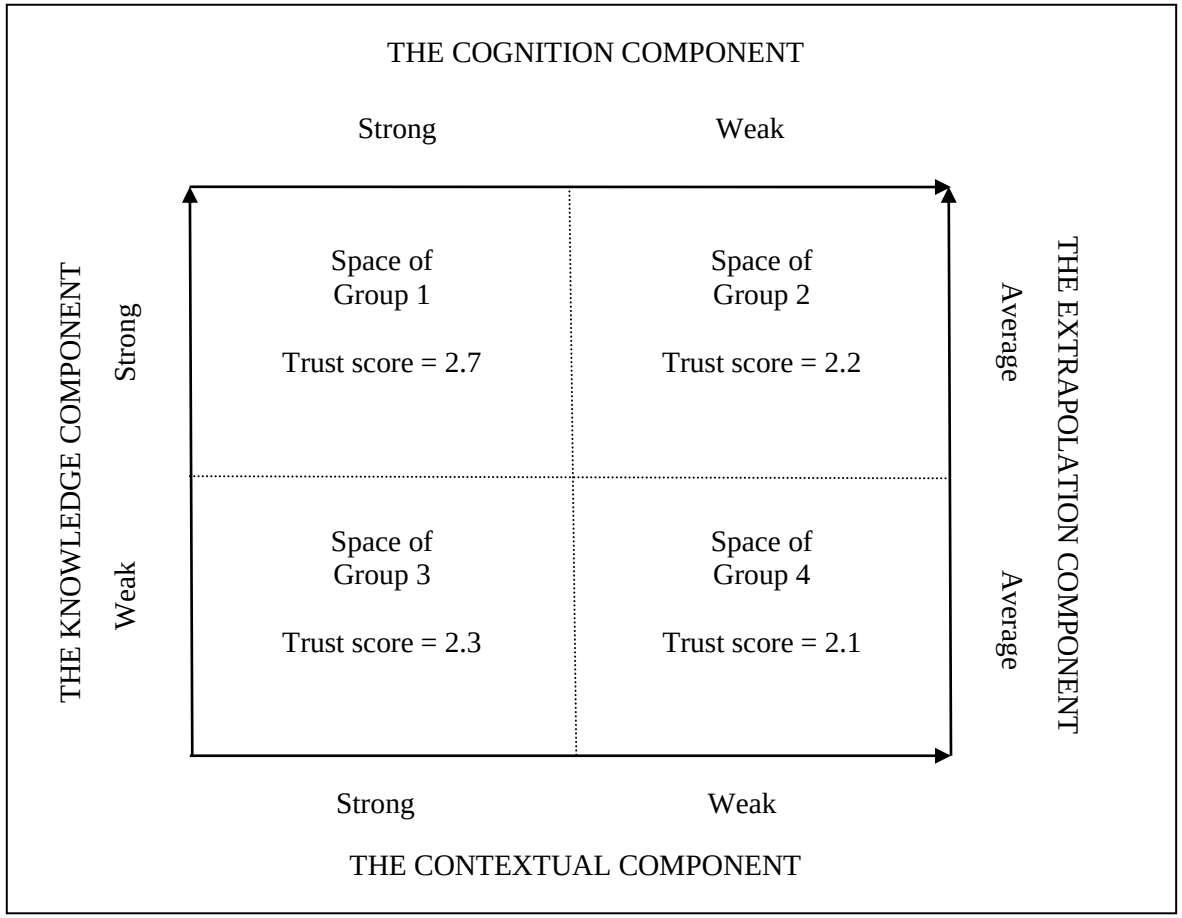

Figure 3. A Four-Dimensional Visualisation of Country Groupings According to the Four Trust Factors' Level of Development

Notes: Austria is included in the calculation of group averages.